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THE MAN OF SCIENCE AND THE PUBLIC[1]

AN APPRECIATION OF SPENCER FULLERTON BAIRD

NEVER are the limitations of language more keenly felt than when the attempt is made to depict a human life.

If I could create, in however small degree, in the minds of those who never knew him, some understanding of the spirit of unselfish devotion to service that animated Professor Baird, of his unfailing wisdom, his clear, comprehending intellect, his evident reserve power, his kindly interest in others, his quiet eloquence in conversation, his serenity of mind and purity of heart, I should be content.

But how impossible it is to give adequate expression to a life of such fulness as that of Professor Baird's. His biographers, one after another, lament their inability to describe in commensurate terms the simple grandeur of this man, and to set forth in proper proportions his achievements. Professor Goode, in one of his memoirs, as if in despair at the feebleness of language to accomplish such a task, says:

> Such a man has a thousand sides, each most familiar to a few, and perhaps entirely strange to the greater part of those who know him.

But Professor Baird was not many-sided in the sense in which that term is usually employed. No one who knew him would have thought of calling him versatile. All who have written of him unite in bearing

[1] Address delivered at the dedication of a memorial tablet to Spencer Fullerton Baird on the forty-fifth anniversary of the establishment of the United States Bureau of Fisheries, Auditorium of the National Museum, February 9, 1916.

testimony to the presence in him of the same sterling qualities of mind and heart.

He was a man of great physical and intellectual strength and endurance, possessing a well-ordered mind, with all its powers under perfect control, a realization, in truth, of Huxley's picture of a liberally educated man:

> That man, I think, has had a liberal education, who has been so trained in youth that his body is the ready servant of his will, and does with ease and pleasure all the work that, as a mechanism, it is capable of; whose intellect is a clear, cold logic engine, with all its parts of equal strength, and in smooth working order; ready, like a steam engine, to be turned to any kind of work, and spin the gossamers as well as forge the anchors of the mind; whose mind is stored with a knowledge of the great and fundamental truths of nature and of the laws of her operations; one who, no stunted ascetic, is full of life and fire, but whose passions are trained to come to heel by a vigorous will, the servant of a tender conscience; who has learned to love all beauty, whether of nature or of art, to hate all vileness, and to respect others as himself.

I have been led to a choice of a theme for this occasion by the memory of a conversation, if that may be called a conversation where one talked and the other listened, which took place more than thirty years ago. Professor Baird then expressed his disappointment that more of the young zoologists of America were not taking up the study of groups of animals, thus making themselves authorities in some not too narrow field. Thus in time authoritative memoirs and monographs would be forthcoming based on our own fauna, valuable alone as contributions to knowledge, and sure to be of assistance in the solution of problems of vital importance to the welfare of the people. The disposition of American teachers, especially in the eastern universities, to interest themselves and their students exclusively in the biological fad of the hour was criticized, but, of course, not unkindly.

We were seated on the veranda of the Fish Commission residence at Woods Hole, and the murmur of a strong tide making to the eastward through the "hole" was in our ears. Since that quiet evening many tides have ebbed and flowed, and many biological fads have risen to flood and have ebbed away, bearing on their bosoms the wreckage of many rejected theories.

Assuming that as accurate a knowledge as it is possible to gain of the living forms that are found in our country is desirable, to what extent, if any, has the situation improved as it relates to those tendencies which disturbed the scientific and patriotic mind of Professor Baird nearly a generation ago?

Had he been on the same spot some twenty-three years later, when in 1907 a considerable number of foreign delegates to the International Zoological Congress, which met that year in Boston, visited Woods Hole, his feelings as an American zoologist could be imagined, when he heard, as many of us did, expressions of surprise from visiting European naturalists, that among all the American zoologists at Woods Hole, drawn as they were from a large number of the universities and colleges of the country, there were so few who had an authoritative knowledge of any part of the fauna of their country.

It is a significant fact that Professor von Graff, who at the Boston meeting was elected to the presidency of the congress for its next meeting, while in this country, made collections of turbellarians at Syracuse, Cold Spring Harbor and Woods Hole and, returning to his university, Gratz, published, four years later, an important paper on these American forms. This paper, beside giving descriptions of seven new genera and thirty-one new species and one new subspecies, contained much anatomical and morphological detail.

Out of the hundreds of young men who had been trained in our universities for research work, why had there not arisen at least one who had already become an authority on von Graff's specialty? Must America be rediscovered, and our birthright taken away from us? Is this failure on the part of American zoologists to become acquainted with their own fauna of a piece with the happy-go-lucky existence which we as a nation have been, and are, living, flinging in spendthrift fashion our great natural resources to the viewless air, whence they come back to us not again any more? Or is it due to the same tendencies which Professor Baird deplored? An answer is suggested by the following statistics, compiled from Dr. Cattell's valuable tables, which, unfortunately, extend back only to 1898: Of the 400 doctorates conferred by our universities for work along zoological lines, excluding physiological and paleontological titles, noted in SCIENCE for the years 1898–1915 inclusive, barely 6 per cent. deal with problems which involve the study of groups as large as a family; and of these there appear to be but two that are of monographic proportions.

The prosperity of the nation is in no small degree dependent upon the understanding and sympathy which exist, and are maintained, between the men of science and the members of our law-making bodies. A challenge might be issued to the leaders of scientific thought in our universities to explain why they have played so small a part in public affairs, and why they have had so little influence upon legislation affecting the health and welfare of the people. It is true that a considerable majority of our national legislators are men learned in the law, and, in consequence of their training, peculiarly unresponsive to new ideas, and disposed to judge things as they are; while the scientific man is inclined to judge things as they ought to be. Thus the scientific man is appalled at the great waste of our natural energy occasioned by the absence of uniform and suitable forestry laws, that would not only help to conserve what we already have, but would make provision for the future. He is inclined, somewhat sharply perhaps, to demand why the energy that is stored in our coal supply, and flowing in every running stream and tide-way has not been made the property of the whole people. He grows impatient under the bonds of the antiquated and chaotic system of weights and measures which we are wearing to our discredit as a supposedly enlightened people, and to our disadvantage in the accomplishment of our commercial enterprises and ambitions. He has difficulty in understanding the state of mind of the person who replies to suggestions that we rationalize the spelling of our words with ludicrous and conventional exhibitions of the skepticism of ignorance, which such suggestions invariably call forth. When he lifts his voice to advocate a change, it seems to him that he is simply a voice crying in the wilderness, for none of these things move the man of precedent, and, learning that even in this day people stone the prophets who would jostle them from the calm of things as they are into the apprehended turmoil of things as they ought to be, too often subdues his voice, and returns in disgust to his laboratory.

As I look over the titles of theses for doctorate degrees in biology, however, knowing that they must, in some fashion, reflect the activities of our biological leaders, I am led to wonder if the failure of science to influence legislation in the interests of the people is not to be charged to the propensity on the part of these leaders to shun the practical. Is there a hierarchy in science that frowns upon independence of thought and action in her sanctuary? That

can hardly be. Let the heads of departments of biological research in our universities then take heart, and not be afraid to follow the lead of Pasteur, who surely committed no violence upon science by undertaking the solution of practical problems.

Let us now turn to the consideration of Professor Baird, the man of science. If there are any who ask what his claims to the appellation, man of science, are, let them turn to the voluminous bibliography, of over one thousand titles, of his writings, one fifth of which are formal contributions to scientific literature. Two of these, his "Mammals of North America" and his "Birds of North America" (Vols. VIII. and IX. of the Pacific Railroad Reports) alone would secure a high place for their author among the world's great scientific men.

To this virtue of original productiveness in science was added signal ability as an organizer and administrator. When, in 1850, he was called from his position of professor of chemistry and natural history in Dickinson College to the position of assistant secretary of the Smithsonian Institution, the young professor brought with him his own private collection, around which, through his genius for organization, grew the great and priceless collections of the Smithsonian Institution and National Museum.

Professor Goode presents the following useful condensed outline of the principal phases of activity in the life of Professor Baird; phases, which, it will be observed, overlap in a complicated manner:

(1) A period of twenty-six years' (1843–1869) occupation and laborious investigation and voluminous publication upon the vertebrate fauna of North America; (2) forty years (1840–1880) of continuous contribution to scientific editorship; (3) five years (1845–1850) devoted to educational work; (4) forty-four years (1843–1887) devoted to the encouragement and promotion of scientific enterprises and the development of new workers among the young men with whom he was brought in contact; (5) thirty-seven years (1850–1887) devoted to administrative work as an officer of the Smithsonian Institution and in charge of the scientific collections of the government; twenty-eight (1850–1878) as practical executive officer, and nine (1878–1887) as secretary and responsible head; (6) sixteen years (1871–1887) as head of the Fish Commission, a philanthropic labor for the increase of the food supply of the world, and, incidentally, in promoting the interests of biological and physical investigation of the waters.[2]

It is in that phase of Professor Baird's life which is presented by his activities as fish commissioner that are to be found illustrations of practically ideal relations maintaining between science and legislation.

From the summer of 1863, when he first visited Woods Hole, he realized the importance of a thorough investigation into the causes of the decrease of the food fishes along our coast.

In 1870 he made a systematic beginning in this inquiry, $100 having been set apart for that purpose by the Smithsonian Institution, and the Treasury Department granting the use of a 30-foot sloop yacht.

Having thus demonstrated to his own satisfaction by personal investigation that a problem existed, the solution of which was of vital importance to the nation, and realizing that the necessary inquiries were beyond the resources of any private enterprise to carry on, he set about securing the support of the national government.

To this task he brought the great powers of his own natural sagacity, to which was added the experience of thirty years of productive scientific work, and nearly four decades spent in the administration of what had grown, under his management, to be a great museum whose activities had become world-embracing. Although it is said of

[2] Smithsonian Report for 1888, p. 83.

him that he could never be induced to make a public address, he spoke easily and fluently in the presence of a few, and with the pursuasive eloquence of simple and exact statement. He soon won interested supporters to his plan.

The following brief extracts from his correspondence, which are taken from Dall's valuable "Biography of Professor Baird," will, I hope, illustrate something of the simple directness of his method of bringing the importance of an inquiry into the causes of the decrease of food fishes to the attention of Congress.

The first is a letter addressed to the Hon. H. L. Daws, M. C., and bears the date December 15, 1870.

Dear Sir: In the accompanying communication I give you a memorandum in regard to the subject of the decrease of the fish of our coast; though I fear I have not expressed my ideas as satisfactorily as might be desired.

In reference to the mode of action to be adopted in regard to this subject I have prepared a resolution which I commend to your consideration.

If you feel inclined to take immediate action in regard to an appropriation to meet the cost of the necessary investigation I would suggest that an item be introduced in one or other of the bills in your hands, providing the sum of, say, five thousand dollars, or as much thereof as may be necessary, to be expended by the commissioner under the direction of the Secretary of the Treasury, in prosecuting investigations into the subject of food fishes of the Atlantic coast, with a view of ascertaining what remedy can be applied toward securing the supply against its present rapid diminution.

The investigation would have to be carried on at several points on the coast, for instance, the Vineyard Sound, the coast of Maine, the Bay of Fundy and perhaps the coast of New Jersey; and require several years for their completion.

Yours truly,

SPENCER F. BAIRD

The following extracts are from a letter of date January 3, 1871, from Professor Baird to the chairman of the House and Senate Committees on Appropriations. They are chosen to show the judicious mingling of information which, as a scientific man, it was his especial province to impart to Congress, with facts touching upon certain practical interests concerning which members of Congress might be sensitive.

. . . During my visit of last summer to the Vineyard Sound and other maritime portions of New England, I was much impressed by the great diminution in the numbers of the fish which furnish the summer food supply to the coast, . . . as compared with their abundance during a previous visit in 1863. . . . The belief is everywhere loudly expressed that unless some remedy be applied . . . the time is not far distant when we shall lose, almost entirely, this source of subsistence and support. . . . The causes assigned are varied, . . . most disinterested persons, however, ascribing the scarcity to the use of nets of one pattern or another and the capturing of the fish on or near their breeding grounds before they have spawned; and urging vehemently the passage of laws for preventing or regulating the employment of nets or weirs.

State action has been invoked at various times for the purpose of securing a remedy for the evil in question; but owing to conflicting interests and the influence of powerful parties who are concerned in maintaining the present mode of fishing, little has been accomplished. . . . Before intelligent legislation can be initiated, however, and measures taken that will not unduly oppress or interfere with interests already established, it is necessary that a careful, scientific research be entered upon, for the purpose of determining what should really be done; since any action presupposes a knowledge of the history and habits of the fish, that, I am sorry to say, we do not at present possess. We must ascertain, among other facts, at what time the fish reach our coast, and during what period they remain; when they spawn and where; what is the nature of their food; what localities they prefer; what agencies interfere with the spawn of the fish; what length of time elapses before the young themselves are capable of reproducing; for how many years the function of reproduction can be exercised; and many other points of equal importance. . . .

Cod and mackerel are not concerned directly in this inquiry, as they are not captured to any great extent in pounds; but since they feed almost en-

tirely on other fish, their abundance on or near our coast depends largely upon that of the kinds mentioned in the beginning of this letter. . . .

With regard to salmon, shad and alewives, which run up into inland ponds and streams to spawn, the protective measures now enforced by State Legislatures while these fish are in fresh water are amply sufficient to secure their increase. There are, however, about forty species of food fishes, belonging almost exclusively to the salt water of the coast from the Bay of Fundy to the Gulf of Mexico which require the consideration herein indicated.

As a result of such quiet but convincing appeals to reason, based on a profound knowledge of the subject, and a full understanding of the results desired, many members of Congress became interested, and a bill which was drawn up by Senator George F. Edmonds and Professor Baird was passed by Congress in 1871.

The resolution which established the office of commissioner of fisheries required that the person to be appointed should be a civil officer of the government, of proved scientific and practical acquaintance with the fishes of the coast, to serve without additional salary.

The choice of the commissioner of fisheries was by the terms of the bill practically limited to a single man, Spencer F. Baird, assistant secretary of the Smithsonian Institution.

It is a fact worth noting that the primary conditions which made possible such public philanthropic work as that exemplified in the life of Professor Baird were secured by the gift to the people of the United States of the foundation whose purpose is "the increase and diffusion of knowledge among men," and which bears the name of the donor—the Englishman, James Smithson.

The scope of the Fish Commission's activities rapidly expanded, as may be seen from the following summary made by Professor Goode. It gives in brief form a synopsis of what the Fish Commission had become at the time of the death of its founder, Professor Baird.

The Fish Commission now fills a place ten fold more extensive and useful than at first. Its work is naturally divided into three sections:

1. The systematic investigation of the waters of the United States and the biological and physical problems which they present. The scientific studies of the commission are based upon a liberal and philosophical interpretation of the law. In making his original plans the commissioner insisted that to study only food fishes would be of little importance, and that useful conclusions must needs rest upon a broad foundation of investigations purely scientific in character. The life history of species of economic value should be understood from beginning to end, but no less requisite to know the histories of the animals and plants upon which they feed or upon which their food is nourished; the histories of their enemies and friends, and the friends and foes of their enemies and friends, as well as the currents, temperatures and other physical phenomena of the waters in relation to migration, reproduction and growth. A necessary accomplishment to this division is the amassing of material for research to be stored in the national and other museums for future use.

2. The investigation of the methods of fisheries, past and present, and the statistics of production and commerce of fishery products. Man being one of the chief destroyers of fish, his influence upon their abundance must be studied. Fishery methods and apparatus must be examined and compared with those of other lands, that the use of those which threaten the destruction of useful fishes may be discouraged, and that those that are inefficient may be replaced by others more serviceable. Statistics of industry and trade must be secured for the use of Congress in making treaties or imposing tariffs, to show to producers the best markets, and to consumers where and with what their needs may be supplied.

3. The introduction and multiplication of useful food fishes throughout the country, especially in waters under the jurisdiction of the general government, or those common to several states, none of which might feel willing to make expenditures for the benefit of the others. This work, which was not contemplated when the commission was established, was first undertaken at the instance of the American Fish Cultural Association, whose rep-

resentatives induced Congress to make a special appropriation for the purpose.[3]

This description of the Fish Commission, although written more than a quarter of a century ago, may stand as a description of the functions of the Bureau of Fisheries of the Department of Commerce to-day.

Thus it is seen that in conceiving the idea of the Fish Commission, Professor Baird not only prepared working plans to relieve an immediate and menacing situation, but, by that act, brought into being an organization which is itself a living and growing thing, and, now become a part of the governmental mechanism, grows with the nation's growth and contributes its own peculiar part towards the conservation and increase of the national wealth.

More than thirty years ago, our government, through the work of Professor Baird, had already furnished a lesson in preparedness that the civilized world recognized, applauded, and in large measure, copied for its own. The following appreciations of Professor Baird's achievements in this respect are taken from G. Brown Goode's "The Smithsonian Institution," Washington, 1897, p. 188:

In 1883, Professor Huxley remarked: "If the people of Great Britain are going to deal seriously with the sea fisheries, . . . unless they put into the organization of the fisheries, the energy, the ingenuity, the scientific knowledge and the professional skill which characterizes my friend Professor Baird and his assistants, their efforts are not likely to come to very much good."

"I do not think," he adds, "that any nation at the present time has comprehended the question of dealing with fish in so thorough, excellent and scientific a spirit as the United States."

The principal French authority, M. Raveret-Wattel, wrote: "Nowhere has government given so much enlightened care to the rational cultivation of the waters, and afforded such efficient protection and generous encouragement."

[3] Report of Smithsonian Institution for 1888, pp. 84–85.

The importance of Professor Baird's services to fishery economy are, perhaps, more fully recognized in Germany than elsewhere. At the first great International Fisheries Exhibition, that held in Berlin in 1880, the juries in their official report said: "We must thank America for the progress which fish culture has made during the past decade"; and the magnificent silver trophy, the first prize of honor, was awarded to Professor Baird by the Emperor.

On the same occasion the president of the German Fisheries Association designated Professor Baird as "the first fish-culturist of the world."

One of the functions of the National Academy of Sciences, which was incorporated by Congress in 1863, is that its members may act in an advisory capacity on scientific questions. It is an important principle that is here recognized, and the country should have benefited more than it has done by this opportunity to secure expert advice. There are some indications that more attention is to be given to this principle than has been the rule in the past. It is therefore timely to suggest that both scientific man and legislator study the history of the establishment of the commission to inquire into the fisheries problem, and to note the behavior of Professor Baird, the man of science, and of the legislators with whom he had dealings. There is to be noted on the one hand sincerity and the absence of self-interest, coupled with exhaustive knowledge of the subject in hand, and on the other an intelligent comprehension of the problem when stated by competent authority, and a genuine desire to improve conditions. Naturally there resulted from this combination practical legislation that has been of acknowledged benefit to the nation and to the world.

The friendly relations which grew up between Professor Baird and Congress may be seen from Professor Goode's charming description:

The power of his pursuasive suavity was never better seen than when in the presence of the com-

mittees of Congress before whom he was summoned from year to year to justify his requests for money to be used in the extension of his work. He was always received with the heartiest welcome, and these keen, bustling, practical men of business, who ordinarily rushed with the greatest of expedition through the routine of the day, forgot their usual hurry when Professor Baird was before them, and listened so long as he could be induced to talk, and not infrequently would wander from the business before them to ask him questions upon subjects which his remarks suggested.

A very practical evidence of their appreciation was the prompt action upon the bill, passed soon after his death, giving twenty-five thousand dollars to his widow in recognition of the uncompensated services which he had rendered as commissioner of fisheries.

The secret of Professor Baird's power rests at bottom on his entire unselfishness, and thorough preparedness. Of such a scientific man as he one could say, and of every scientific man one ought to be able to say, paraphrasing a celebrated letter to certain people of Corinth: He is not puffed up, seeketh not his own, rejoiceth in the truth, and hopeth all things.

Around the Smithsonian Institution as a nucleus are clustered the various buildings of the National Museum and Department of Agriculture. Whatever else they may stand for, they are, in an important sense, monuments of such work as that which Professor Baird performed when he enlisted the interest of Congress in scientific questions. With these examples of the generosity of Congress towards science before us it may be asked why take time to argue for an accomplished fact? It is true that a good beginning has been made, and no fault is to be found, so far as I am aware, with the relations which exist between the scientific bureaus of our government and Congress. The life and work of Professor Baird laid broad and secure foundations upon which others have builded well. But there exists between science in this country as represented by laboratories of research in universities and elsewhere, on the one hand, and our state and national legislatures on the other, a gulf that is but inadequately bridged. I remember seeing, a few years ago, in some of our periodical literature, remarks that were meant to be derogratory, about what the writers called "Washington science." Such deliverances were, of course, but little more than evidence of a certain state of mind; nevertheless they are an index of a gulf, or barrier, or unexplored middle ground, between science, as represented by some of our most talented investigators, and members of our law-making bodies who desire to be shown probable practical benefits that are expected to follow legislation which they are asked to favor. Professor Baird, through his own contributions to knowledge, won a place among the first American men of science. By his example and influence he opened up avenues of research and promoted investigations that led to the advancement of knowledge to a greater degree than any other American has done. Science under his direction suffered no loss of purity by being clothed in garments of utility and thus made attractive to minds not otherwise prepared to appreciate her charms. With men equipped as he was to bring before legislative bodies projects in the interests of the public, selfish interests, which thrive on the ignorance of the people, would have little effect in hindering wise legislation. With men like him to the fore unkind remarks, calculated to widen the breach between science and legislation, such as "impractical and visionary scientists," on the one hand, and "pork-barrel politicians," on the other, would not be made. They would not be made because scientific man and legislator would meet on common ground, and, understanding each other, would say to their fellows, and to the pub-

lic: Here is a man anxious to improve the condition of his fellows; listen to what he has to say.

Recent world events make it evident that it is going to become more and more necessary to the life of the nation to conserve all its natural resources, and to coordinate all the energies of the state so that the whole may become available for any contingency that can be foreseen, and that all parts work together with the least possible friction, and with highest efficiency in results.

For the proper realization of the development of an ideal life for our nation we must be taught by example. Do we not find in the life and character of this great American, in whose honor we are met to-day, a model and a type? He was thoroughly equipped, both by natural gifts and by patient industry, for the battle of life as it had to be fought out; and he devoted his great powers unselfishly and ungrudgingly to the service of the public. His was the preparedness of mind and heart that must be the ruling traits of the American of the future; of mind that will lead to the successful solution of such national and international problems as arise, without loss of dignity or undue waste of energy; of heart, that even the gates of ambition and selfishness can not prevail against it.

Professor Baird, and those members of the House and Senate who learned to understand his sterling worth, together taught the world a great economic lesson. May we not express the hope that their example will be followed in these times and henceforth; that our legislators get the inspiration and information that is to determine legislation from those who know, rather than from those who do not know, even though they may be able to adorn their ignorance with the charms of eloquence that move the multitude.

On the nineteenth of August, 1887, amid surroundings which were in large part the realization of his own thought and activity, in the residence building of the United States Fish Commission, at Woods Hole, Massachusetts, Professor Baird, man of science and servant of the public, died.

I remember the day and the hour. It was afternoon, and the tide was low. I recall a picture of a red sun hanging over Long Neck[4] and reflected in the still waters of Great Harbor, of sodden masses of seaweed on the dripping piles and on the bowlder-strewn shore; and there rises again the thought that kept recurring then, that the sea is very ancient, that it ebbed and flowed before man appeared on the planet, and will ebb and flow after he and his works have disappeared; and a singular, indefinite impression, as if something had passed that was, in some fashion, great, and mysterious, and ancient, like the sea itself.

And now, more than a quarter of a century after his death, we who knew him, and were in greater or less degree privileged to be associated with him, are met here to give visible expression to the reverent esteem in which we hold in memory the image of this pure and lofty character, and to our high appreciation of his life and labors for the public good.

Mr. Secretary: It is no small honor that you and I share to-day in having our lives for a brief moment fall under the shadow of the name of one of our country's greatest men.

My honor it is to present to the Bureau of Fisheries of the Department of Commerce, of which you are the official head, as the gift of his associates and followers, and in their behalf, this tablet to the memory of the founder and organizer of the United States Bureau of Fisheries, and first

[4] Now known as Penzance.

commissioner of fisheries, Spencer Fullerton Baird.

Edwin Linton
Washington and Jefferson College

OBSERVATIONS ON THE SOLAR ECLIPSE MADE BY THE CROCKER EXPEDITION OF THE LICK OBSERVATORY[1]

The preparations for observing the total eclipse, including the standardizing of the photographic plates by means of a standard lamp and the loading of the plate holders were completed Friday evening. The weather conditions were not promising Saturday morning, with the sky completely covered with clouds of medium thickness, and these continued throughout the day, except for a short break, which proved to be one of the most remarkable coincidences known to me.

The prospects for a clear sky were apparently hopeless during the long hours of waiting, almost up to the time of totality. Fifty minutes before the moon's shadow was due to reach us we noticed a thinning of the clouds near the western horizon. It seemed hopeless to expect that the rift would continue or reach the region of the sky that we were interested in, but it did.

A very small area of the blue sky free from clouds had the sun at its center exactly at the center of the total phase, and all other parts of the sky were clouded. This region cleared not more than a minute before the beginning of totality, and clouds again covered the sun less than a minute after the passing of the shadow.

All of the instruments and all of the observers were ready, and the program went through as planned. Goldendale is situated exactly on the central line of the eclipse path. Observations made by my colleague, Professor Tucker, at Mount Hamilton, several months ago, had shown that the moon was slightly ahead of its predicted place, and he estimated that the eclipse would occur twenty seconds earlier than the time set down for it in the Nautical Almanac. We accordingly allowed for this in our program, and totality began two seconds later than Tucker's predicted time. The observed duration, one minute and fifty-seven seconds, agreed perfectly with the Almanac data.

DARKNESS UNUSUALLY PRONOUNCED.

The eclipse was a very dark one, the darkest of the six observed by me. The reading of newspaper print would have been difficult under the open sky. The chickens retired as if for the night. They were heard to give the morning cock crows before emerging a few minutes later. It was probably the shortest night in all their lives.

The eclipse phenomena, both celestial and terrestrial, formed a spectacle indescribably unusual and magnificent. The solar corona was, of course, the center of interest. It seemed brighter than usual, and its general outline was more elongated than we had expected, in view of the fact that we are not far from sun-spot maximum.

The coronal streamers were visible two and one half solar diameters to the east and west of the sun, but scarcely more than one diameter to the north and south, and the outline form was approximately triangular, with the eastern steamers converging to a sharp vertex at their most easterly point and the western streamers diverging to the base of the triangle at the most westerly points. The photographs thus far developed confirm the naked-eye description and extend the east and west streamers out to more than three diameters.

The solar prominences were numerous and large, as we should expect at a time of great sun-spot activity, but these did not concern us greatly, as they can be observed well without an eclipse. However, the prominences contribute greatly to the interest of the photographs, as the arching of the coronal streamers around the prominences is conspicuous, leaving no doubt that the forces which produce the prominences are controlling the forms of coronal streamers in their neighborhoods.

A few of the twenty-six photographs, secured

[1] Press despatch revised by the author for publication in Science.